

REMARKS

Claims 2, 3, 5, 7, 8-13, 23, 24, 27-30, 34, 41, 42, 45-47, and 50-52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Paoli, U.S. Patent 5,317,170, in view of Shimada et al., U.S. Patent 4,689,652 (hereinafter "Shimada"). Claims 4, 31-33, 43, 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Paoli and Shimada in view of various other references. Applicants respectfully traverse all rejections.

Claim 3 and dependent claims

Paoli is cited as teaching "forming at least one of Fresnel lens (178) and holographic diffuser (86 in Figure 4) on at least one surface of a semiconductor light emitter . . ." See Office Action, page 2. Paoli "does not teach that said forming comprises pressing a stamping block against at least one surface of the semiconductor light emitter." See Office Action, page 4. Shimada is cited as teaching "forming at least one of Fresnel lens and holographic diffuser by stamping." See Office Action, page 4. Shimada teaches at column 6, lines 15-35:

At first, a photoresist is applied over the substrate surface, and the annular zone pattern is printed on the surface of the photoresist layer with the aid of an electron beam irradiation apparatus. In each annular zone, the beam intensity or exposure time is varied in the radial direction of the Fresnel lens, to thereby vary the polymerization degree of the photoresist. In this way, the individual annular zones printed or depicted on the photoresist are converted into stepped setbacks in cross-section thereof. By using the photoresist layer shaped in this manner as a stamping die, the Fresnel lens shown in FIG. 8B can be realized.

Shimada thus teaches a stamping die made of photoresist. In contrast, claim 3 is amended to recite "pressing a stamping block against at least one surface of said semiconductor light emitter, the stamping block comprising a material selected from the group of molybdenum, titanium, zirconium, graphite, silicon carbide, sapphire, stainless steel, tungsten, tantalum, columbium, and alloys thereof." Applicants have found no teaching in Shimada that the materials listed in claim 3 may be used as a stamping block, nor any

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suggestion to use any material other than photoresist as a stamping block. Accordingly, even in combination, Paoli and Shimada do not teach all the elements of claim 3.

Claims 2, 4, and 7-11 depend from claim 3 and are therefore allowable for at least the same reason as claim 3.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Paoli and Shimada, and further in view Kish et al., U.S. Patent 5,376,580 (hereinafter "Kish"). Kish is cited as teaching "forming . . . executed concurrently with a wafer-bonding process." See Office Action, page 5. Though the passages of Kish cited by the Examiner do teach a wafer-bonding process, they do not teach that wafer-bonding may be executed concurrently with any other process, much less that wafer bonding may be executed concurrently with forming a Fresnel lens or holographic emitter, as recited in claim 4. Accordingly, claim 4 is allowable for this additional reason.

Regarding claim 10, the passage cited by the Examiner teaches "the p-confinement layer 18 of FIG. 1, which was replaced by a distributed Bragg reflector (DBR) 86 in FIG. 4, may be coated with a highly reflective metal which serves as an electrical conductive, optical reflector to form a laser cavity." This passage does not teach "coating said Fresnel lens or said holographic diffuser with a reflective material" as recited in claim 10. Claim 10 is thus allowable for this additional reason.

Regarding claim 11, Applicants have found no recitation in the passage of Paoli cited by the Examiner of "forming an optical element on the surface opposite of said extraction surface." Claim 11 is thus allowable for this additional reason.

In the previous office action response, Applicants argued that a person of skill in the art would have no reasonable expectation that Shimada's photoresist stamping block would be strong enough to stamp the surface of a semiconductor light emitter. In response, the Examiner states that "Paoli does teach that the Fresnel lens, 'can be formed by ion milling or

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reactive ion etching or other means as is known in the art.” [Citation omitted] Stamping is indeed another well known means of forming Fresnel lenses as shown in the secondary reference, Shimada et al in the office action.” See Office Action, page 11. Applicants respectfully disagree with the Examiner’s analysis that Shimada demonstrates that stamping is a known means of forming Paoli’s fresnel lenses. Paoli teaches forming “fresnel lenses are formed on the exposed n-contact layer 180.” See Paoli, column 12, lines 27-28. This n-contact layer is a semiconductor layer. The methods mentioned by Paoli, ion milling and reactive ion etching, are well known methods for shaping semiconductor layers. Shimada’s photoresist stamping block is meant to shape not a semiconductor layer but a glass or plastic layer (see, for example, Shimada, column 4 lines 51-54). Semiconductor layers are typically hard and crystalline, and therefore difficult to shape, while glass and plastic are typically soft and therefore easy to shape. Accordingly, since Shimada teaches only shaping glass or plastic, Shimada does not establish that stamping is a well known technique of shaping semiconductor layers, contrary to the Examiner’s assertion. The Examiner’s assertion is akin to saying that a reference that teaches a method for shaping tar demonstrates that it is well known to use that method for shaping a diamond.

Claim 5

Claim 5 recites “forming at least one of Fresnel lens and holographic diffuser on at least one surface of a semiconductor light emitter to affect light emitted by said semiconductor light emitter; wherein said forming comprises at least one method selected from ablation, machining, scribing, and electron discharge machining.” The Examiner correctly notes that “Paoli does teach that the Fresnel lens, ‘can be formed by ion milling or reactive ion etching or other means as is known in the art.’” See Office Action, page 12, emphasis in original. Thus, the combination of Paoli and Shimada teaches only ion milling,

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reactive ion etching, and stamping. However, the Examiner goes on to state "the other methods are well known methods in the art to form Fresnel lenses." See Office Action, page 12. Applicants respectfully request that the Examiner provide a reference demonstrating that the methods recited in claim 5 are well known in the art, as required by MPEP section 2144.03, which governs the examiner's ability to support an obviousness rejection with common knowledge in the art. MPEP 2144.03 states "If the applicant traverses such an assertion the examiner should cite a reference in support of his or her position."

Since the combination of Paoli and Shimada does not teach "ablation, machining, scribing, and electron discharge machining" as recited in claim 5, claim 5 is allowable over Paoli and Shimada.

Claim 12 and dependent claims

Claim 12 recites "a first optical element stamped on at least one surface of said semiconductor light emitter . . . wherein the stamped surface is one of an alloy comprising $(Al_xGa_{1-x})_yIn_{1-y}P$ where $0 \leq x \leq 1$ and $0 \leq y \leq 1$ and a III-nitride alloy." Claim 12 is allowable over the combination of Paoli and Shimada because Applicants can find no teaching in either reference that the stamped surface may be $(Al_xGa_{1-x})_yIn_{1-y}P$ or III-nitride. Paoli teaches in various places that the contact layers on which Fresnel lenses may be formed are III-As materials. See, for example, column 4 lines 21-35. Shimada teaches that the stamped surface is glass or plastic. See, for example, column 4 lines 51-54.

Claims 13, 23, and 24 depend from claim 12 and are therefore allowable for at least the same reasons as claim 12.

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Claim 27 and dependent claims

Claim 27 recites "stamping at least one optical element on at least one surface of a semiconductor light emitter to affect the light emitted by said semiconductor light emitter using a stamping block comprising a material selected from the group of molybdenum, titanium, zirconium, graphite, silicon carbide, sapphire, stainless steel, tungsten, tantalum, columbium, and alloys thereof." As described above in reference to claim 3, the Examiner cites only Shimada as teaching stamping. Applicants have found no teaching in Shimada that the materials listed in claim 3 may be used as a stamping block, nor any suggestion in Shimada to use any material other than photoresist as a stamping block. Accordingly, even in combination, Paoli and Shimada do not teach all the elements of claim 27.

Claims 28-33 depend from claim 27 and are therefore allowable for at least the same reasons as claim 27. Claims 31-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Paoli and Shimada, and further in view Fogarty, U.S. Patent 5,141,677. Fogarty is cited as teaching "stamping . . . executed at an elevated temperature . . . [and] lowering said elevated temperature to facilitate the separation of a stamping block from the light emitter." See Office Action, page 6. As such, Fogarty adds nothing to the deficiencies of Paoli and Shimada with respect to claim 27, described above. Claims 31-33 are thus allowable over the combination of Paoli, Shimada, and Fogarty.

Claim 34

Claim 34 recites "at least one optical element stamped on at least one surface of said semiconductor light emitter . . . wherein the stamped surface is one of an alloy comprising $(\text{Al}_x\text{Ga}_{1-x})_y\text{In}_{1-y}\text{P}$ where $0 \leq x \leq 1$ and $0 \leq y \leq 1$ and a III-nitride alloy." Claim 34 is allowable over the combination of Paoli and Shimada because Applicants can find no teaching in either reference that the stamped surface may be $(\text{Al}_x\text{Ga}_{1-x})_y\text{In}_{1-y}\text{P}$ or III-nitride. Paoli teaches in

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various places that the contact layers on which Fresnel lenses may be formed are III-As materials. See, for example, column 4 lines 21-35. Shimada teaches that the stamped surface is glass or plastic. See, for example, column 4 lines 51-54.

Claims 41 and 42

Claims 41 and 42 recite a Fresnel lens, a holographic diffuser, or optical element "stamped on a surface of said semiconductor light emitter; wherein the stamped surface is one of an alloy comprising $(Al_xGa_{1-x})_yIn_{1-y}P$ where $0 \leq x \leq 1$ and $0 \leq y \leq 1$ and a III-nitride alloy." Claims 41 and 42 are allowable over the combination of Paoli and Shimada because Applicants can find no teaching in either reference that the stamped surface may be $(Al_xGa_{1-x})_yIn_{1-y}P$ or III-nitride. Paoli teaches in various places that the contact layers on which Fresnel lenses may be formed are III-As materials. See, for example, column 4 lines 21-35. Shimada teaches that the stamped surface is glass or plastic. See, for example, column 4 lines 51-54.

Claims 43 and 44

Claim 43 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tomomura et al., U.S. Patent 4,988,579 (hereinafter "Tomomura") in view of Shimada. Claims 43 and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Paoli and Shimada, and further in view Tomomura. Applicants respectfully traverse the rejection. Claims 43 and 44 are each amended to recite "wherein the stamped surface is one of an alloy comprising $(Al_xGa_{1-x})_yIn_{1-y}P$ where $0 \leq x \leq 1$ and $0 \leq y \leq 1$ and a III-nitride alloy." Applicants have found no teaching of the quoted limitation in any of Tomomura, Paoli, and Shimada. Claims 43 and 44 are therefore allowable over any combination of Tomomura, Paoli, and Shimada.

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Claim 45, 52 and dependent claims

Claim 45 recites "stamping an optical element in a material, said material being transparent to light emitted from said light emitting device, said material being one of high index optical glass, III-V semiconductors, II-VI semiconductors, group IV semiconductors, high-index organic semiconductors, high index organic compounds, and mixtures or alloys thereof; and bonding said material to a semiconductor light emitter."

Applicants have found no teaching in the portions of Paoli and Shimada cited by the Examiner of stamping an optical element in the materials recited above in claim 45. The passage of Paoli describing the figure cited by the Examiner, Fig. 8 (column 12, line 49 through column 13, line 43) does not recite a material for forming the lens. Shimada teaches at column 4, lines 51-54, that the lenses are formed in soda glass or plastic, not the materials listed above in claim 45.

In addition, the Examiner has not pointed to a section of Paoli or Shimada that teaches an optical element bonded to the semiconductor light emitter. Column 12, line 49 through column 13, line 43 of Paoli described lenses positioned over an array of devices, but Applicants can find no teaching that those lenses are bonded to the array. Column 4 lines 46 through 49 of Shimada state "a transparent substrate 56 . . . is correspondingly deposited on the photosensor array so as to cover the photodiodes 50." This passage of Shimada does not state that the lens material 56 is bonded to the semiconductor light emitter, as recited in claim 45.

Since the combination of Paoli and Shimada do not teach the materials recited in claim 45 and do not teach that material in which the optical element is stamped is bonded to the light emitter, claim 45 is allowable over Paoli and Shimada. Claims 46, 47, 50 and 51 depend from claim 45 and are therefore allowable for the same reasons. In addition, Applicants can

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find no teaching in Paoli or Shimada of a bonding material as recited in claim 50. Claim 50 is therefore allowable over Paoli and Shimada for this additional reason.

Claim 52 recites "an optical element stamped on a material transparent to light emitted from said light emitting device, said material being one of high index optical glass, III-V semiconductors, II-VI semiconductors, group IV semiconductors, high-index organic semiconductors, high index organic compounds, and mixtures or alloys thereof; wherein said material is bonded to said semiconductor light emitter" and is thus allowable for the same reasons as claim 45.

Comments on the Examiner's Response to Arguments

The Examiner's Response to Arguments section contains responses to arguments made by the Applicants in response to the Examiner's 102 rejections of the claims based on Ito et al. and Tomomura et al. Applicants have not responded to these arguments because the Examiner has not included these rejections in the present office action, and thus appears to have withdrawn these rejections. Applicants' silence on these sections in the Response to Arguments portion of the Office Action should not be construed as agreement with the statements made by the Examiner.

In view of the above arguments, Applicants respectfully request allowance of all pending claims. Should the Examiner have any questions, the Examiner is invited to call the undersigned at (408) 382-0480.

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Respectfully submitted,

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